BEGINNINGS OF FOREST RESEARCH

AT THE

PRIEST RIVER FOREST EXPERIMENT STATION

J. A. LARSEN

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Location and Early Development	1
The Weather Stations	2
Seed Testing	3
Planting Studies	4
Source of Seed Study	5
Thinning Studies	5
Trial of Exotics	6
Follow-up on Logged Areas and Methods of Cutting Timber	6
Study of Natural Restocking After Burns	8
Growth and Yield Studies	9
The Making of a Type Map for Region I	9
Study of Forest Succession	10
Beginning Forest Fire Studies	10
Personnel, Visitors and Homesteaders	12
List of Publications	15

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LOCATION AND EARLY DEVELOPMENT

The Priest River, which drains the southern end of Priest Lake in northern Idaho, cuts a fairly straight course southward to its junction with the Pend Oreille near the town of Priest River. On both sides of its valley, about twenty miles apart, loom outriggers of the Selkirk Mountains. In general these mountain spurs taper off gently toward the valley bottoms. There are various levels of somewhat gravelly benchland, representing early erosion deposits. Some, like Jack Pine Flat extending from Coolin to East River, and Benton Flat, are too gravelly for farming. Some higher old lake beds, like the Fox Creek meadow, where the outlets were dammed by glacial drifts or moraines, have better agricultural possibilities.

The eastern slopes, facing west against the afternoon sun, bear marks of pronounced erosion. They are drained by Soldier Creek, East River, Benton Creek, Fox Creek, Big Creek, and two more toward the south. The western slopes are drained by the West Branch of Priest River, and Snow Valley.

The cutting of timber and driving of logs to the sawmill at Priest River began shortly after the Civil War, with timber being cleared where the east side creeks flow into the Priest. At these points early settlers' families, coming west when the Great Northern Railway was built, took up June 11 homestead rights. (The June 11 law allowed homestead entry on arable land within the National Forests.) There was open but stumpy land ready for pasture. Often there were log cabins for stock or shelter, erected by the early loggers, such as the Praters at Big Creek. They came in rickety wagons (and later, cars) bringing all their meager possessions. They lived off the land - with vegetable garden, cow, hogs and chickens, plus fishing and wildlife - or earned money in logging camps.

On the east side of Priest River, about 15 miles north of the town of Priest River and 10 miles south of Coolin, is an old gravelly benchland created by the morainic debris. This was the site, near the mouth of Benton Creek, in the heart of the white pine region, that was chosen in 1910 by Mr. Raphael Zon for the Forest Experiment Station. The advantages of this location were accessibility; abundant young, mature and older timber with a high ratio of pine; some open lands for planting experiments; an assured water supply; and seclusion from the distractions of populous centers. The location was fed by constantly flowing fresh clean water of Benton Creek, right under the peak of a mountain; the year-round flow of water filled a small dam, from which water was supplied for the station's need. There were about thirty acres of partially-cleared land, with two small log cabins, presumably built by early hunters or trappers. (One of these cabins became the chicken house; the other was used for a time for a solitary pig -- and that is a story in itself...)

Mr. Zon and his three young Forest Assistants - Donald Brewster, William Morris and Frank Rockwell - began to establish the station in 1911. They set about hiring local labor, who brought horses, plow and scraper for

making an access road from the county road toward the small Benton Creek meadow. They cleared sites for the building of a residence, a laboratory and a horse barn. A greenhouse was built, a septic tank installed, and fencing provided. They bought miscellaneous tools, equipment for housekeeping, and a bathtub - the first tub ever owned by the U.S. Forest Service. The first residence put up came to be known as Cottage 1, which housed the Brewster family - Donald, Anne and Priscilla.

The Larsen family - Ansgar, Jenny and 6-week-old Margaret Elaine - arrived early in March 1913, driven from Priest River in a dead-axle wagon. They stopped en route for dinner at the Prater's Halfway House on Big Creek. During the first six months at the station the Larsens shared house and meals with the Brewsters, while two carpenters from Spokane were building Cottage 2. Soon after, the bungalow Cottage 3 was built for the clerk, Mr. Lee Stratton and family, who came from Miles City. However, since Mrs. Larsen and daughter were for a year in Norway, the Strattons moved into Cottage 2. When Mrs. Larsen returned, the Larsens occupied Cottage 3. Later, when Brewster enlisted, and stayed at the Presidio in San Francisco, Cottage 1 became the Larsen home. Brewster later was assigned to duty at the Forest Products Laboratory in Madison, and eventually moved to South Carolina. Larsen continued in charge at the station until Mr. Weidman took over. In the fall of 1921 we moved the headquarters to Missoula.

Three more frame structures were erected before 1918. A double wagon shed, with an upper story workshop and storage area, was built in 1914, between the barn and the laboratory building. The woodshed and ice house to serve the three homes was built in the winter of 1915-'16, when one of the heaviest snowfalls was registered. It had a second story designed especially for use as a winter Ranger School. However, since such a hastily built and poorly insulated thing could not be heated satisfactorily, another larger 1-story building was put up, with a large hall on one side, kitchen and a room for numerous double bunks on the other.

Of these frame structures only Cottage 1, the barn, wagon shed and Ranger School remained after 1940. The rest were cleared away by the CCC crews under the direction of Lyle Watts. Then came a new laboratory building, and a guest house with quarters also for foresters on temporary assignment.

The first investigations proposed were as follows: weather data, seed testing, planting experiments, source of seed trials, thinnings, value of exotic trees, follow-up on logged areas, the why of calamitous forest fires, natural restocking after burns, growth and yield plots in the white pine forest. In addition to all these we undertook an 'extra curricular' study - the mapping of the forest types in the entire Northern Rocky Mountain Region, and the correlation of each forest type with air temperature and precipitation controls.

THE WEATHER STATIONS

Three separate weather observation points were chosen: one on the northeast aspect in the young white pine forest; one on the southwest slopes

supporting yellow pine and Douglas fir, and a third on the partially opened and sandy soil of Benton Flat, which functioned as a central or control. Subsequent to the first five years a location nearer the buildings, sometimes known as station 4, became the permanent control for the Priest River Forest Experiment Station co-operative records.

Equipment was supplied by the U.S. Weather Bureau in Washington. The stations were equipped with maximum and minimum thermometers, air thermographs, psychrometers, wind vanes with anemometer readings, rain gauges, and snow-measuring sticks. In addition the control station had a sunshine recorder and a tipping bucket, by which sun, rain and time were recorded on the battery-charged meteorograph.

At the end of each month reports covering air temperature, precipitation and wind movement were sent to the U.S. Weather Bureau headquarters in Boise. These reports did not include data on sunshine, evaporation, soil temperature and moisture, which were also collected for the three locations.

There were also studies in germination, survival and growth of seed from the native tree species on ashes and on natural unburned surfaces, together with organic and mineral tests of the soils at each location. This data formed the bases for natural reproduction investigations recorded in Site Factor Variations and Responses in Temporary Forest Types in Northern Idaho, Ecology Monograph, January 1940.

Eventually Larsen added evaporation records and soil thermographs. In preparation for the Ph.D. thesis he brought representative soil samples to the Iowa State University Soils Laboratory in Ames, Iowa for complete physical, chemical and organic analysis.

A supplementary weather station was later added on the northwest aspect in a stand of pure Douglas fir. All of these weather and soil data were published by Larsen.

SEED TESTING

The testing was done for the Savanac Forest Nursery located at Haugan, Montana. The greenhouse sandboxes were heated by hot water pipes from the boiler in the basement of the residence close by. Every day the sand temperatures were recorded. In this way we could plot and compare germination curves with temperature, constructing both current and energy curves. Special emphasis was given to the white pine seed germination which was often delayed and becoming troublesome at the nursery. After numerous tests by which the seed was treated with heat or frost, soaking or stratification in moist sawdust, we discovered that the fresh seed which we ourselves had extracted under controlled heat and careful handling gave no indication of the supposed delayed ripening period. Much of the Savanac seed had been crushed and extracted under very high temperature. For details and final reports see:

Larsen, J.A. Methods of Stimulating Germination of Western White Pine Seed Jour. Agric. Research 31: No. 9, 1925.

Larsen, J.A. Comparison of Seed-testing in Sand and the Jacobsen Germinator Jour. Forestry, Oct. 1918
Larsen, J.A. Some Characteristics of Seed of Coniferous Trees from the Pacific Northwest National Nurseryman, Vol. 30, No. 9, 1922
Larsen, J.A. and Brewster, D.R. Studies in Western Yellow Pine Nursery Practice Jour. Agric. Research, Vol. 31, 1925.

Larsen learned from the tests of forest tree seed in Copenhagen of the rapid and satisfactory Jacobsen germinator used in Denmark, and put it to use at the Priest River Experiment Station. This was also adopted for use by the Iowa State University Botany Department.

PLANTING STUDIES

It was early considered urgent for the Forest Service to begin replanting denuded areas, especially such as were burned over a second time, where all natural reseeding had been destroyed by intense heat emanating from the mass of dead debris left after the first burning. To proceed systematically in the planting studies it was proposed to test ages and quality of planting stock, the best methods and tools to employ, the season which would give the highest survival, etc.

Planting can be varied in many ways, as to time of year, four methods of setting roots in the soil (center, cone, side of hole or slit), kind of hoe, space or bar to use, and proper tamping. Of course there must always be a fully developed root augmented by transplanting. It should be the function of the nursery to sell or send out adequately rooted stock of uniform size and proper balance of tops and roots.

On the logged and cleared bench near the river (Jergen's Flat) southwest of the station there are eastern white pine plots where many tests were made and compared over a period of years. Planting varied with the four methods of root-placement. Since it is on a fairly favorable ground, it was difficult to prove which method should be favored.

Eventually it was settled that extensive plantings could be made most economically and successfully by fall installations, using the one-hand planting mattock devised at Savanac. On rocky or badly eroded slopes, however, a two-hand mattock or a good bar specially made with provision for pushing in with the foot would do the job. Fall planting was favored for several reasons: At that season the nursery work was less pressing, and plants set out before ground freezing allowed roots to become more firmly established, thereby giving better survival than most spring-planted stock. Planting age of stock, or time (spring or fall) has received very little experimentation. Differences vary much, according to soil, moisture and species.

Information obtained and the results were reported on by Brewster, Delavan and Larsen and issued in official reports by W.C. Wahlenberg at the Savanac Forest Nursery in Sowing and Planting Season for Western Yellow Pine Jour. Agric. Research, Vol. 30, Feb. 1925, and Age Clases of Western White Pine Planting Stock in Relation to Aspect and Site, Etc. Jour. Agric. Research, Oct. 1926.

SOURCE OF SEED STUDY

During the first four years of the station about twenty different source plots were set out on the Benton Flat, using western yellow pine representative of all the western 'races' together with five or six from our own local area - east, middle and western sections. These were planted in 50 x 50 feet plots, 100 per plot, spaced 5 x 5 feet. It was the work of the staff to count and measure all the trees annually, with numerous tests for age classes, sizes and quality of stock, and to protect them from injury and Ceanothus competition. No replanting was done. If one or more died by frost or drought, the fact must be recorded. For all we recorded growth and survival annually. See Mr. Weidman's report Evidences of Racial Influence in a 25-Year Test of Ponderosa Pine Jour. Agric. Research, Vol. 59, 1939, also notes by Kempff in Northwest Science, 1928, and reports by A.E. Squillace and Silen, Racial Variations in Ponderosa Pine Science Monograph 2, 1962.

Mr. Raphael Zon suggested obtaining planting stock of Douglas fir from different areas in western United States. These, set on Benton Flat, were all adversely affected by spring frost. (The cold air did not drain out from the Benton Flat area.) However, the samples of regional western yllow pine planted there survived well. See report by Kittredge on this project.

THINNING STUDIES

The plan was made by Brewster and Larsen, beginning in 1914, for forest thinning test plots in young larch and dense white pine forest on Benton Flat west of the station clearing, in a 60-year-old 'second growth forest'. Joe Kittredge assisted in the mapping and tallying. A second series of test plots, planned by Larsen in 1919, with installations by Baughman, Kempff and Larsen, was located part way up Benton Creek, on a low bench area adjacent to the creek.

Each plot was half an acre in area. In each series there were three plots, thinned light, medium and heavy, and a fourth left unthinned. Each plot was surrounded by a strip ten feet wide, thinned to the same degree. Measurements were taken in the beginning and were to be taken at five or ten year intervals. There seems to be no record of re-measurements.

This project, though not considered urgent, received only half-hearted support in the District Office. However, visitors to the station always expressed much interest. At a location such as an experiment station it is of advantage to have something tangible to show. See the following reports:

Larsen, J.A. Thinnings Ames Forester, 1926
Larsen, J.A. and McCarthy Products from Immature White Pine Stands by Thinning Idaho Forester, 1925
Foiles, Marvin W. Thinning From Below in a 60Year Old Western White Pine Stand Station Report No. 19, 1955

TRIAL OF EXOTICS

Between the Coolin road and the main river, on the Jergen's Flat openings, plots were planted to eastern white pine and miscellaneous north-of-the-Mason-Dixon-Line hardwoods. Ten or more 50 x 50 feet plots of hardwoods - maples, locusts, oaks, elms, basswood, walnut, etc. - were planted carefully in spaces 5 x 5 feet in the spring of 1912 and '13. They were carefully weeded, counted and measured each fall. Not one tree survived after 1915, presumably because of the scant summer rains, within the Pacific type of precipitation, and early and late frosts. Furthermore, the soil, which had supported old white pine, etc., was evidently less suitable for hardwoods than for evergreens because of high acidity.

The more northerly species of U.S. hardwoods have been planted for shade, shelter or ornament in Spokane, Coeur D' Alene, Moscow, Sandpoint, etc., but have survived only by dint of constant watering, brought through tender age by sprinkling and care until the deeper roots reach moist subsoil. They also grow on stream borders, where roots obtain underground moisture. It is true that exotic evergreens are more successful than hardwoods, though there are oaks growing naturally on river flats in Washington and Oregon.

The only published report on this venture is Larsen, J.A. Why Hardwoods Do Not Grow Naturally in the West Idaho Forester, 1922. Baker has written conclusions about similar trials within the Intermountain Region.

For the eastern white pine plots we used half acre units and different installation methods and tools. The deep and loamy soil proved highly favorable for the 'Strobus' species, which all showed remarkable development. It was observed, however, that in their early stages there was considerably more snow breakage than with the native white pine stock.

FOLLOW-UP OF LOGGED AREAS AND METHODS OF CUTTING TIMBER

At the turn of the century and before, when the Lake States' white pine timber began to peter out, the lumbermen moved west and found abundant virgin white pine in northern Idaho, where the U.S. Forest Service willingly negotiated many sales under contract. Graduate foresters who were called upon to suggest the form of cutting were not sure how to begin. They began by recommending European cutting methods - leaving seed trees or groups of seed trees, or alternating logged strips with uncut strips. None of these methods stood the test.

The recommendation for use of the seedtree system was tried, but most of the trees left were blown down. Even seed trees in small groups failed. In mature and older forests sizable groups remained, but the everpresent fir and hemlock could not be marketed and must be removed or destroyed to prevent seeding and competition on the cut areas.

Cuttings on the Coeur D' Alene forest, near Pritchard, were made by leaving alternate strips uncut for seeding. These strips were laid up and down the slope, to facilitate logging. This was ruinous to the loose soil,

and set up conditions for scandalous erosion. (They were not aware that most of that white pine soil was loose Eolian deposit from the Columbia Plateau.) In the Schwarzwald of Germany they employ alternate strips, but lay them on the diagonal to the slope, and snake the logs out downward. On the Coeur D' Alene they snaked the logs down by 'donkey power'. This gave rise to the quip "Ucelli Gulch and No Celli Gulch". Ucelli was the Italian who logged with a 'donkey'.

There were some experiments at the Priest River Station in girdling of fir and hemlock, or notching and poisoning, but these were soon discountenanced by reason of unsightliness and the increase in fire hazard. See Larsen and Brewster Girdling, etc. for Removal of Undesirable Trees Agri. Research, Vol. 31, 1925.

The cutting methods shifted to a rough selection method, which simulated a rough shelter-wood system, removing first unsalable fir and hemlock, but leaving promising seed trees of white pine, and a promise of much needed heat and drought protection for seedling white pine. See Kittredge, Preston, Brewster, Wolff and Silcox Development of Marking Practice in Western White Pine Jour. of Forestry, Vol. 15, 1917

The harvesting problems were, for the most part, solved later by the use of variations in the 'selective' method of cutting, devised by Mr. Zon and staff in the Lake States. Difficulties arising from hemlock and fir largely disappeared with the development of plywood and their use in other interior building purposes. A discussion of after-logging problems has been given by R.H. Weidman in Progress of Research in Silviculture in the Inland Empire Northwest Science Vol. 7, No. 3, 1933..

For the study of logged areas in the western white pine type, aiming to reveal what was happening to the seed trees or blocks of trees left, and the amount and kind of natural reproduction, etc., Brewster, Larsen and assistants gridironed the opened areas with compass and chain, the compassman tallying and the counter calling stops, reporting new seedlings for every strip on a 1/1000 acre area, observing restocking or no restocking, tallying each chain separately to give information on seed dispersal, distances and amounts, keeping counts on burned and unburned surfaces separately. This method indicated seed dispersal from seed trees or groups. A similar method was used by Larsen when he examined burned areas - especially on the Coeur D' Alene and the St. Joe Forests.

It soon became evident that more seedlings came on the unburned than on the burned surfaces, which gave rise to the thought that perhaps the seed was already present in the duff at the time of cutting. To confirm or disprove this we gathered seed under the mature timber for testing in the greenhouse and found some to be viable, though they did not look promising. Moreover, in order to get definite information, we established seed in protected beds within the timber, with the idea of recovery and testing from year to year, to learn how long such seed could be stored in the duff. After a period of three years it appeared that viability had vanished. There might, however, be a few seeds which remained viable longer, by reason of protection by charcoal, or by being placed in crotches of stumps, perhaps stored by squirrels.

Other seeding tests which threw some light on these problems resulted from sowing fresh seed of the native species of trees side by side, on burned ashy surfaces and on unburned duff surfaces, at the three weather station locations. After three seasons of careful counts and measurement, comparing with our weather data, snow melting, etc., all species but the hemlock thrived and grew best on the ash surfaces at all the stations. The white pine did much better on the northeast aspect; the yellow pine won out on the southwest slope. The big toll from death of seedlings occurred during the second season, eliminating yellow pine from the northeast and hemlock and cedar from the other sites.

Reports dealing with such studies, in addition to the afore-mentioned reports on girdling, marking practice and silviculture research, are:

Larsen, J.A. Site Factors and Responses in Temporary Forest Types in Northern Idaho Ecology Monograph Jan. 1940 and Iowa State University Doctoral Thesis No. 379, 1940.

Larsen, J.A. Effect of Removal of Virgin White Pine Forest upon the Physical Factors of Site Ecology Vol. 3, Oct. 1922.

Larsen, J.A. Some Factors Affecting Natural Reproduction after Logging in Northern Idaho Jour. Agric. Research, Vol. 28, 1924

Larsen, J.A. and Lowdermilk, W.C. Slash Disposal in the Western White Pine Forests of Northern Idaho U.S.D.A. Forest Service Circular No. 292, 1924

STUDY OF NATURAL RESTOCKING AFTER BURNS

When we began to study the forests of northern Idaho, we found a rather promiscuous, irregular distribution of even-age classes from the youngest to the oldest stands, and everywhere, even under the old duff or at the bases of old snags and stumps, we could always find evidences of past fires. It is true that the younger stands are purer than the older, and freer from hemlock, cedar or fir understory. The fires which raged in the past cleared larger or smaller areas according to the severity of the season, and the seed available for re-establishment of the forest could have been maturing on the trees that succumbed in the fire and released from the opening cones, perhaps at the very time of burning. If so, the seed found seedbed on the fresh ashes.

These matters were pondered in the process of actual strip surveys made mostly over the wide upper watershed of Coeur D' Alene River. This has been described and the conclusions set forth in my report. The work was done mostly on the 1910 and 1919 extensive burns on the Coeur D' Alene and St. Joe National Forests during late summers by a two or three man crew with compass and chain, the compassman taking the tally of seedlings on a 1/1000 acre plot, by age and species, separately on burned and unburned surfaces. Thus the new seedlings revealed their locations and given distances from the source of the seed trees.

After the fire has prepared the ash germinating surfaces, eliminating much of the obstruction and competition for establishement of seedlings, the character of the environment will decide which of the species shall survive on a particular site. Whichever of the species of trees happens to be in a good seed year will also have some influence in determining the composition of the subsequent stand of trees. See reports:

Larsen, J.A. Natural Reproduction after Forest Fires in Northern Idaho. Jour. Agric. Research, Vol. 30, 1925
Larsen, J.A. Fires and Forest Succession in the Bitterroot Mountains of Northern Idaho Ecology Vol. 10, 1929

GROWTH AND YIELD STUDIES

About the year 1920 the station responded to the cry from the office of forest management for information on yield of the timber crop. This was a heavy project. It was decided to establish plots in representative stands, mainly on the Coeur D' Alene National Forest, within the young age classes of white pine, in areas of from one-half to one acre, on regular topography, with absence of underbrush or down trees. The series included three plots: lower slope, middle slope, upper slope. Larsen was in charge, with Haig and Flodberg assisting. We travelled to work and back in Larsen's car, sleeping and eating as near to the stand areas as possible.

We numbered and recorded every tree. The Experiment Station bought a rotating numbering machine for the metal tags hung breast high on each tree. We measured diameters and obtained the present heights of 10% of the trees given by number, the purpose being to re-measure at given subsequent intervals of time, preferably by decades. Tabulations were made, with curves for diameters and heights, plus site descriptions.

By selecting plots of different ages up to the limit of merchantability, we could from curves approximate the yields for given slopes and aspects, and by successive decade measurements obtain more accurate and dependable data. See I.T. Heig's report Second Growth Yield Stands and Volume Tables for the Western White Pine Type U.S.D.A. Tech. Bulletin 323, 1932.

THE MAKING OF A TYPE MAP FOR REGION I

It was my own ambition to produce a map of the forests according to their climatic requirements, in other words, a map which would delineate distribution and locations of the climax horizontal altitudinal belts and, by use of the U.S. Weather Bureau records of temperature and precipitation, establish their limitations. This was my own private study, beyond the regularly approved projects.

From the office of drafting I secured a district map and carried it with me in a tube. Whenever in the field working on the different National Forests, or when in contact with rangers and forest supervisors, I would bring out my map and colored pencils and seek to fill in more accurate information about District I locations, boundaries of major forest types, describing each as to location, elevation, climatic requirements and under-vegetation. I would describe the types' composition and ecological features and typical understory and soil conditions.

The types considered were 1. alpine-spruce, whitebark pine, mountain

hemlock or mountain larch; 2. Douglas fir and larch; 3. Douglas fir and cedar in deep northern valleys. (Larch and lodgepole pine form temporary types, sometimes.) The results of this study are given in my report Forest Types of Montana and Northern Idaho and their Climatic Controls Ecology, Jan. 1940. Mr. Elers Koch like the map, and hung it in his office in Missoula.

In 1922 C.C. Delavan, district fire chief, and Larsen completed a report with curves and figures for the normal 50-year U.S. Weather Bureau records. The precipitation curves compared for the east-of-the-Rockies went up in summer, showing a relation to the central Mississippi type, while all areas to the west of the main Rockies dropped considerably in summer - but with much greater downpour during the fall and winter months. See Delavan and Larsen Climate and Forest Fires in Montana and Northern Idaho U.S. Monthly Weather Review, 1922.

STUDY OF FOREST SUCCESSION

Most of the foregoing activities and investigations paved the way for an understanding of the natural returns of the vegetation including the forest trees after severe denudations by fire. In this connection good use was made of the herbarium specimens which staff members and assistants collected from time to time and which a lady in the U.S.D.A., Mrs. Hutchings from Kansas, identified and named. A knowledge of the plant habitats led to a closer appreciation of the soil and forest tree associations and successions, which vary for the different forest types. In the white pine mesophytics, the air-borne seeds of fire weed, willow and crowsfoot, and sometimes Ceanothus, are followed by bird-seeded species of cherry, honeysuckle, etc. (Much of the brushy vegetation renews from root sprouts.) These give way to less tolerant trees with understories of medium tolerant evergreen shrubs as mertensia, huckleberry, pyrola, Linnaea, etc., all giving way in the climax forest to very tolerant mosses and creeping club mosses. Since the intolerant western yellow pine is also a dominant climax member in that type of forest, the final understory in the plant cover is composed of many xerophytic evergreens. See:

Larsen, J.A. Forest Types of the Northern Rockies and Their Climatic Controls Ecology, Vol. 11, 1930

Larsen, J.A. Association of Trees, Shrubs and Other Vegetation in the Northern Idaho Forests Ecology Vol. 4, 1923

BEGINNING FOREST FIRE STUDIES

From the presence of young even-aged stands of western white pine, etc., plentiful on the Coeur D' Alene, St. Joe and Kaniksu National Forests, it was judged that a year in the 1880's had experienced holocaust - uncontrolled fire like that of 1910 or worse. The Indians said the miners had set the fires; the miners blamed the Indians. Those fires probably were set by lightning strikes, which occur when the rotating westerly winds reach climaxes of heat and air pressure, and a low pressure with moister atmosphere follows. (This situation occurred on the Kaniksu Forest the summer of 1919.)

U.S. Weather Bureau records in the northwest U.S. forest region reveal that the winter of 1910 showed scant snowfall; spring and summer had sub-normal rainfall. In addition to this situation, the 10-year-old U.S. Forest Service was young, inexperienced and unprepared to cope with the crisis. There were insufficient maps and trails. Neither were there sufficient lookout points. There were few ranger station-to-lookout trails, or telephones. In 1910 or before, a graduate forester had recommended for each lookout point a sighting compass giving the bearing of the lightning-set fire. When a second lookout man sighted the smoke, that fire could be pinpointed on the map.

The winter after the 1910 blow-ups on the St. Joe, Coeur D' Alene, Kaniksu, Lolo, Colonel Greeley wrote an article for the Journal of Forestry urging that the U.S. Forest Service seriously concentrate on these points: immediate construction of trails, installation of telephones, and perfecting of methods for pinpointing locations of smoke from lightning strikes.

Early in 1916 came a letter from the Washington headquarters, with a request for us to begin fire studies. There was no intimation bearing on how or where to begin. I know of no subject or project which is of such infinite variation: forest types, age, density, aspects, elevation, ground cover and endless dissimilarities.

Nevertheless, at the station we began sampling pine needle duff, weighing samples on the sensitive gold dust scale mornings and evenings in the lab, with doors and windows open, so neither rain nor dew would interfere. We also made and timed burning tests. The upshot was that the samples increased in weight overnight, meaning that the duff absorbed moisture as the atmospheric humidity increased, and became less flammable with increase in moisture - and vice versa.

During an eight-day cycle of daily increasing air temperature, with corresponding lowering of humidity, there is an increase in fire hazard. These periods are associated with increasing atmospheric pressure and augmenting air aridity. When the climax is reached, a low pressure arrives with an increase in humidity, and there is a reduction in high hazard.

A factor to remember is that in Washington, Oregon, Idaho and western Montana the prevailing westerly winds lose moisture when crossing the Coast and Cascade Ranges, and when passing over the Columbia and Intermountain Plateaus, thereby making the atmosphere even more dessicating.

At the climax of this high air temperature and pressure with low humidity occur the devastating forest-fire afternoon blow-ups. Simulating a tornado, heat, fire and smoke ascend as in a chimney, with circular movement. An inferno which moves by the prevailing westerly can destroy a timbered watershed of forest in one afternoon, like the Stillwater watershed on the Blackfeet National Forest and the St. Regis watershed on the Lolo. In the '30's the same phenomenon took place in the Tillamoock country of Oregon. In this case the fire got a real boost and spurt from a mass of logging slash.

It was in 1917 that we began to get weather records on the nearby lookout stations, and found out that the westerlies were the dessicating winds.

For status of humidity of the winds we learned to use white pine cylinders' weight, which varied according to the relative humidity of the air. See:

Larsen, J.A. Weather Records for Mountain Lookouts in Northern Idaho Jour. Forestry, Vol. 20, 1922 and U.S. Monthly Weather Review, Vol. 50, 1922
Larsen, J.A. The Forest Fire Season at Different Elevations in Idaho U.S. Monthly Weather Review, Vol. 53, 1925

The horrors and hazards during the 1910 fires are minutely described by Betty Goodwin Spencer in her book The Big Blowup, Paxton Printer, Caldwell, Idaho, 1958.

In August of 1919 one of the most intense fire seasons was on. The entire southern Priest River Valley was aflame, and threatened to engulf the station. We were next in line for the sweep expected the following day. Hastily we buried all records from our investigations, in the meadow below the laboratory, prepared to bring the women and children to Coolin, and planned to come back, if possible, to defend the buildings.Everyone piled into the Larsen's 7-passenger Studebaker. However, three miles north, on Jack Pine Flat, the Studebaker broke an axle and we were stalled. We hid the tools in the forest and returned to the station on foot - by moonlight. Luckily the next day dawned calm, damp and cloudy, under the approach of the low-pressure area, and the fire did not spread. The crews trenched it, and there was no further threat that summer.

In conclusion -- When Larsen was on detail in Washington, D.C. the winter of 1920, he had all the material on fire research typed into a forty page progress report, and left a copy there with Mr. Clapp and Bill Sparhawk.

Strange to say, this report never - ever - generated any receptive comment from the headquarters of the U.S.F.S. Forest Experiment Stations. One is tempted to conclude that neither Mr. Clapp nor Sparhawk was aware of the multifarious variations of meteorological or physiographical elements and diversities involved in an assessment of the forest environmental composition.

PERSONNEL, VISITORS AND HOMESTEADERS

There were three grades of employees during the first decade: first, those who had degrees in Forestry - i.e., graduates from U.S. Schools of Forestry and who were present at the station anytime during the year, but mostly during the winter months, to assist and learn; second, students who assisted during the summer months with instructions, counting or measuring, etc., as in installation of yield plots or thinning, or recording seedling count during natural reproduction studies; and third, those of ranger or assistant ranger status.

Members of the first group usually lived and boarded with one of the station families, or, if married, lodged and cooked in the lab or Ranger School building. There was Ernest Rogers, single, who lived in the lab room; T. Hansen; A.O. Bensen; Charles McCarthy; Joe Kittredge from Harvard; Garry Kempff and family from the U. of Wisconsin; W.C. Lowdermilk from U. of New Mexico; C.C. Delavan, Lloyd Hornby and wife; Sam Fullaway. The Kempff family lived in Cottage 2.

Amont the students were E.M. Davis, M. Richardson from the U. of Montana; St. Maries; Mr. Baughman; Charles Brewster from the U. of Idaho; Rodney Paine; Herman Flodburg; D. Sharma from India via the U. of Idaho.

Fullaway and Paine surveyed with compass and Abney through the deep snow for the excellent contour map of the Experimental Forest.

Only after 1915 or '16 was there an assigned forest ranger, a man who cared for the maintenance work, the team and equipment, took care of fire protection, etc. Robert Hillman and family came from Moscow. He became clerk. Mr. (and Mrs.) Hamlin came from Sokane. There was I.T. Haig, and Pat O'Golder. Pat had such large feet he couldn't buy boots. He assisted Kempff scaling logs in the snow, contracted penumonia and died. This was about the time of the flu epidemic of '18.

And there was Ed Fogelsang, an old prospector and woodsman, who was our standby for the winter's wood supply.

One very welcome compensation for the isolation came from the many visitors from here and there, who would remain for a few days or a week, sharing our home, meals and conversation. I can well remember Jack Adams, the author of the "Use Book"; Raphael Zon, in charge of silvics and forest research, who came for his annual inspection trip; the pre-eminent ecologist Dr. Fred Clements and Mrs. Clements; William Greeley; Ferdinand Silcox; John Preston; David T. Mason; Walter Lowdermilk, and the genial Glenn Smith, who headed the winter session of the Ranger School. And there was the piano tuner who came in mid-winter, found such hospitality and care for his horses that he stayed nearly a week. That, too, is another story...

From the schools of Forestry, J.W. Toumey, Nelson Brown and Dr. Shattuck. From the Regional Office and several supervisors' headquarters, Elers Koch, Jim Girard, Meyer Wolff, Mallory Stickney and J.R. Weir. In 1917 Mr. Anton Smitt was with us for a few days, seeking evergreen seed for tryouts on the west coast of Norway. (I have seen some of the Douglas fir there, near Bergen, doing very well.) Later came a Swedish forester who came to see America. He travelled all the way to Alaska to bag a Grizzly.

With the homesteaders we maintained friendly contact as much as time permitted. There were Fourth of July picnics and Christmas celebrations at the East River Schoolhouse. During the period of World War I, the women of the neighboring settlements gathered at the station regularly for needlework in the war effort.

To the south, at Fox Creek meadow, lived the Amblies, McDonalds and Schoenfeldt. Beyond, southward, lived the Praters at Big Creek. Mr. Prater's father, Benton, a Civil War veteran, lived with them - it was for him that Benton Flat was named. Down the line southward, near the river, lived the Huffs, Chambers, Purcells and a delightful elderly couple from Sweden, the Falks. There were several other families along the southeast lower areas, of Italian and German descent.

North from the station, down on the meadow, lived Mrs. McKenzie and her hired hand. On the river bench near by was Bert DeWolf with his aged mother. Not far south of the school, in a little clearing on the east side of the

road lived the Burns family from the Ozarks.

At East River meadow lived the Gilbert family - Ed, his Norwegian wife, and their 3 boys and 3 girls. They made a go of it in good shape, by hard work. Ed and his two grown sons were good axemen, who often gave us assistance with the heavy work at the station. It was mainly for their minor children, and the Burns' children, that the schoolhouse was built. Ed tracked down the county's school fund at Sandpoint, and hired Mr. Schoenfeldt to build the East River School. Ordinarily the Larsen family had the privilege of lodging and boarding the teacher, and this made it possible for Margaret-Elaine to trot along with her to school each day.

Also near the East River meadow were the Meyers and the McCanns. Mrs. McCann taught the school for awhile, as did Mrs. Purcell. Mr. Purcell was a minister, who conducted morning worship services at the school.

There were 'lone wolves', too - like Ed Hewett, Fischer and Brown up along East River, and Panhandle Pete on Jack Pine Flat -- squatters or 'settlers' dissatisfied or disillusioned with society, seeking solace in nature's peace and solitude, living as best they could by odd jobs or by gun and rod.

J. A. Larsen

B.A. Yale University 1908
M.S. Yale School of Forestry 1910
Ph.D. Iowa State University 1935

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This piece needs a summary paragraph. At 98, Dr. Julius Ansgar Larsen, the Norwegian-born son of a sailing family, with a Yale education earned the hard way, relives the years at the Experiment Station vividly. At age 91, his Oslo-born wife, Jenny, participates with recollections of the people who passed through their lives and left their imprint. And their daughter Margaret gets lost in her memories as she edits and types.

This paper culminates a lifetime of work devoted to forestry, family, friends and students. Each area has been blessed and stimulated and has grown because of his understanding of science and of people. I am glad to add my bit and to be a part of his family.

Bob Blumenschein (R.W.)

his son-in-law

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